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ABSTRACT

This publication is designed to serve state-level planners interested in reviewing the key concepts of state planning and management systems. The compact nature of the review and its organization in guideline format should provide a ready reference for the practitioner seeking to develop and improve management systems for vocational education in his state. Major sections of the report include: (1) Systems and Systems Analysis, (2) Management by Objectives, (3) Operations Research, (4) Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM), (5) Planning, Programming, Budgeting Systems (PPBS), (6) Management Information Systems, and (7) Performance Indicators. (Author/JS)

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PLANNING AND MANAGEMENT SYSTEMS FOR STATE PROGRAMS OF VOCATIONAL AND TECHNICAL EDUCATION

An Application of Research

Information Series No. 48

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ERIC Clearinghouse on Vocational and Technical Education

preface

This publication is designed to serve state-level planners interested in reviewing the key concepts relative to state planning and management systems. The compact nature of the review and its organization in guideline format should provide a ready reference for the practitioner seeking to develop and improve management systems in his state. The author has been selective by citing references believed to be especially useful to practitioners. A related publication on the same topic for local administrators is available from The Center.

The profession is indebted to Daryush Nowrasteh for his scholarship in the preparation of this paper. Recognition is also due Florence Sutler, Division of Occupational Educational Planning, New York; Cecil Johnson, State Department of Education, South Carolina; and Darrell Ward, Research and Development Specialist, The Center, for their critical review of the manuscript prior to its final revision and publication. J. David McCracken, Information Specialist at The Center, coordinated the publication's development.

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PLANNING AND MANAGEMENT SYSTEMS FOR STATE PROGRAMS OF VOCATIONAL AND TECHNICAL EDUCATION: AN APPLICATION OF RESEARCH

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introduction

This paper is an introductory study of planning and management concepts that have emerged in recent years and their use and application in state programs of vocational and technical education. The study attempts to define a number of concepts. In the case of planning, programming, budgeting, and management information systems, it delves into a detailed analysis and application of these techniques as they relate to occupational educational programs at the state level. A more comprehensive treatment of planning, programming, budgeting, and management information systems should not lead the reader to believe that the other concepts presented are inferior to these two techniques. Equal attention given to all of the techniques pertinent to this study would not be a cost-effective allocation of time or space. Moreover, in this paper terms such as operations research, cost-benefit, cost-effectiveness, management by objectives, are used as alternative terms for systems analysis which is a complementary tool for planning-programming-budgeting. These terms have similar meanings from both methodological and economic points of view.

The author extends his appreciation to The Center for Research and Leadership Development in Vocational and Technical Education at Ohio State University and the Wisconsin State Board of Vocational, Technical and Adult Education which made this study possible.

The author accepts responsibility for the final form of this study but wishes to express gratitude to Professor Stephen J. Knezevich of the University of Wisconsin, Eugene I. Lehrmann, State Director and Donald M. Brill, Assistant State Director of the Wisconsin Board of Vocational, Technical and Adult Education, and Dr. L. Joseph Lins, Research Director of the Coordinating Council for Higher Education for their comments and suggestions.

problem statement

The fundamental issue on the expenditure side of public budgeting is: What criteria should be used in allocating the billions of dollars of society's resources among the competing activities, rather than allowing the taxpayer to use the money for his own self-benefit? Over three decades ago V. O. Key (1940) pointed to the lack of a budgetary theory which would provide direction on formulating an answer to the above question. Key called attention to the fact that budgeting is essentially a form of applied economics insofar as it requires the allocation of scarce resources among competing demands. He urged that the question posed here be explored from the point of view of economics theory.

Economists have long been interested in the identification of policy issues that help promote economic welfare and, in particular, in the identition and implementation of efficiency measures by means of which the society could attempt to use its limited resources optimally.

Manpower and tax resources available to support public services such as education are limited. During the 1969-1970 school year total expenditures on education at all levels for public and private schools totaled approximately $70 billion. The following table measures the effort to support education in the United States since 1929-1930 by comparing expenditures with gross national product (GNP). The GNP represents the total national output of goods and services at market prices. It measures this output in terms of the expenditure by which the goods and services are acquired. The expenditures comprise purchases of goods and services, consumers and government, gross domestic investment, and net exports of goods and services (*Digest of Educational Statistics*, 1970). As expenditures rise and available tax resources are stretched, the public demands justification for the costs of education.

Table 1—Gross national product related to total expenditures[1] for education: United States, 1929-30 to 1969-70

Calendar Year	Gross national product (in millions)	School year	Expenditures for education	
			Total (in thousands)	As a percent of gross national product
1	2	3	4	5
1929.....	$103,095	1929-30	$ 3,233,601	3.1
1931.....	75,820	1931-32	2,966,464	3.9
1933.....	55,601	1933-34	2,294,896	4.1
1935.....	72,247	1935-36	2,649,914	3.7
1937.....	90,446	1937-38	3,014,074	3.3

1

Table 1—(continued)

Calendar Year	Gross national product (in millions)	School year	Expenditures for education	
			Total (in thousands)	As a percent of gross national product
1	2	3	4	5
1939.....	90,494	1939-40	3,199,593	3.5
1941.....	124,540	1941-42	3,203,548	2.6
1943.....	191,592	1943-44	3,522,007	1.8
1945.....	212,010	1945-46	4,167,597	2.0
1947.....	231,323	1947-48	6,574,379	2.8
1949.....	256,484	1949-50	8,795,635	3.4
1951.....	328,404	1951-52	11,312,446	3.4
1953.....	364,593	1953-54	13,949,876	3.8
1955.....	397,960	1955-56	16,811,651	4.2
1957.....	441,134	1957-58	21,119,565	4.8
1959.....	483,650	1959-60	24,722,464	5.1
1961.....	520,109	1961-62	29,366,305	5.6
1963.....	590,109	1963-64	36,010,210	6.1
1965.....	684,884	1965-66	45,397,713	6.6
1967.....	793,544	1967-68	57,477,243	7.2
1969.....	932,100	1969-70	[2]69,500,000	7.5

[1] Includes expenditures of public and nonpublic schools at all levels of education (elementary, secondary, and higher education).

[2] Estimated.

NOTE: Beginning with 1959-60 school year, includes Alaska and Hawaii.

SOURCES: U.S. Department of Health, Education and Welfare, Office of Education, *Biennial Survey of Education in the United States*; *Statistics of State School Systems*; *Financial Statistics of Institutions of Higher Education*; and unpublished data. U.S. Department of Commerce Office of Business Economics, *Survey of Current Business*, August, 1965, July, 1969, and April, 1970.

For years public school administrators have supplied information relative to the cost of transportation per pupil, bus, and/or route. They have also been quick to point out what it costs to maintain the physical facilities of a school, to feed a child, and to conduct athletic programs. However, few school administrators can state what it costs to raise a child's reading or mathematical skill from a given level to a higher one; neither can they communicate to the taxpaying public how the achievement of a marketable skill relates to its costs.

Given this background, school administrators have become more cognizant of the need for management concepts that help communicate effectively to the public the cost and benefits of the output of educational institutions. They need management techniques that will improve decision-making, planning, and forecasting.

The major concern of this paper is to introduce to administrators and planners of vocational education programs at the state level management concepts that have emerged in recent years with particular emphasis on Planning, Programming, Budgeting Systems (PPBS) and Management Information Systems (MIS). Specific concepts presented are:

1) Systems and Systems Analysis
2) Management by Objectives (MBO)
3) Operations Research (OR)
4) Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM)
5) Planning, Programming, Budgeting System (PPBS)
6) Management Information Systems (MIS)

systems and systems analysis

The administrator of an educational enterprise oriented to the employment of a systems approach may find it helpful to consider different definitions of systems analysis. An attempt is made here to provide a broad overview of the concept by presenting several different facets of the systems approach.

The term "system" encompasses a wide range of concepts, for example, solar system, circulatory system, political system, economic system, and communication system. In his "General Theory of Employment, Interest and Money," John Maynard Keynes (1936) conceptualized the interrelationship between natural and man-made forces which interact and are integrated into a total system known as an economic system. This concept implies the existence of a set of subsystems so integrated that the whole displays unique attributes. In addition, the word system connotes plan, order, method, and arrangement.

A definition of system must include the notion that: 1) a system is a group of integrated and interrelated activities performed in sequence to achieve a predetermined objective; and 2) a system is an ongoing activity encompassing humans, materials, and procedures coordinated to produce an identifiable service or output.

E. S. Quade (1964) provides the following definition of systems analysis:

> Systems analysis might be defined as an inquiry to aid a decision-maker choose a course of action by systematically investigating his proper objectives, comparing quantitatively, where possible, the costs, effectiveness, and risks associated with alternative policies or strategies for achieving them, and formulating additional alternatives if those examined are found wanting. Systems analysis represents an approach to, or way of looking at, complex problems of choice under uncertainty, such as those associated with national security. In such problems, objectives are usually multiple, and possibly conflicting, and analysis designed to assist the decision-maker must necessarily involve a large element of judgment.

Systems analysis employs quantitative as well as non-quantitative approaches. Charles J. Hitch (1963) offers the following conception of systems analysis:

> Systems analysis at the national level, therefore, involves a continuous cycle of defining military objectives, designing alternative systems to achieve those objectives, evaluating these alternatives in terms of their effectiveness and cost, questioning the objectives and the other assumptions underlying the analysis, opening new alternatives, and establishing new military objectives.

According to Stephen J. Knezevich (1969), the salient features of the systems approach are:

1) Clear delineation of long- and short-range objectives capable of being translated into operationally meaningful activities and subsequent evaluation.

2) Recognition of the dynamic nature of goals and sensing when new ones have emerged or when a reordering of priorities among existing objectives is imperative.

3) Recognition of change as normal in viable organizations operating within an environment in ferment and creation of methods to facilitate prudent change.

4) Generation of alternative means of utilizing resources to attain objectives.

5) Creation of models to study part or all of the system.

6) Utilization of quantitatively-oriented tools and procedures in analysis of systems.

7) Dedication of a high priority in the time schedule of top echelon administrators to planning and programming activities.

8) Employment of interdisciplinary teams of specialists in problem analysis, new systems design, operations evaluation, and the like.

9) Consideration of coordination of the ever growing number of educational specialists within the system as a matter of high echelon concern.

10) Implementation of sophisticated objectives and scientifically oriented procedures in decision-making.

Knezevich's treatment of the features of the systems approach may be of more interest to the administrator in an educational environment. However, many of the attributes of the systems approach aimed at the accomplishment of predetermined objectives come into focus by viewing the concept of management by objectives.

management by objectives

Management by Objectives (MBO) is a process oriented toward the accomplishment of a predetermined objective at some point in the future. The emphasis is upon where the organization is going, what is to be accomplished, how the organization plans to accomplish its objectives (that is, alternative ways of achieving a predetermined objective), what resources and activities are to be generated in the environment in which accomplishment is to occur, and how well the actual performance conforms to the desired level of performance with explicit adherence to pre-specified target dates.

In a broad sense, Management by Objectives will encourage horizontal and vertical integration of the objectives of the organization, its subunits, and individuals. This, in turn, will reduce the overlapping of activities and/or responsibilities and will lessen the impact of conflicts within the organization, enabling the organization to form a better sense of where it is going and how it will get there (Howell, 1967).

In essence, the MBO approach deals with the results that an administrator or manager can expect to achieve within a pre-specified time period. For example, this objective could be approached in the following way if it is to produce a program, a service, or a product such as creating human capital:

a) Producing a program, product, or service and then creating a market to consume the output;

b) Defining a market, analyzing it, determining the needs of that market, and then designing a process for the production of the service, product, or program that the market demands.

This method of approach has been called management by results, goal management, and management by objectives.

operations research

The body of knowledge known as management sciences includes Operations Research (OR), where a range of mathematical models has been developed as a technique in the decision-making process.

Operations Research is basically a problem solving approach, employing scientific analysis to management decision problems where the use of quantitative methods, modeling, and simulation are stressed. A model reflects conditions existing in the "real world" that allow experimentation and testing, and increases understanding of a problem under consideration without the commitment of resources. It is merely a theoretical framework and there is no reason that it should be mathematical. A particular advantage of OR is its emphasis on the use of models. It is essential to note that the systems concept is embodied in the definition of operation research. According to Churchman and others (1957):

> Operations research is the application of scientific methods, techniques, and tools to problems involving the operations of a system so as to provide those in control of the system with optimum solutions to problems...

Development and Construction of an OR Model. A model is developed to describe the system under study. Both constraints and objectives, in terms of their related variables, are described. The following is a typical OR model:

$$P = f(U_i, C_j)$$

In this model we have specified a particular relationship between (P), the dependent variable, and (U_i) and (C_j), the independent variables of the system.

Where:

U_i = a set of uncontrollable variables
C_j = a set of controllable variables
P = the system's performance
f = a functional notation

Since U_i, C_j and P are related to some phenomena in the "real world," all we can expect from this model is that it approximate a complex

situation. By analyzing and manipulating this model, we can learn about the real-world situation that the system intends to portray.

Deriving a solution from the OR Model. Selection and generation of reliable data is most essential in obtaining valid results. Thus, the success or failure of an OR study is determined by the reliability of the data utilized to test the model. Electronic data processing can be used to collect, store, process and tabulate the results in this phase.

Testing an OR Model and the solution derived from it. Stable relationships are sought for predictive purposes. The model is tested to see how a small change in one variable affects the result. If the solution isn't stable enough to suit our purposes, we must reexamine our model with regard to the following:

a) Incomplete theory: A theory is necessarily incomplete; an abstraction cannot explain everything. For instance, we may have left out a variable that does affect our objective variable.

b) Incomplete specification of our model, that is, perhaps we have linearized a nonlinear relationship,

c) Aggregation of data: In aggregating data, variables that express individual peculiarities may be missing.

d) Error of measurement (observation): Even if behavior were exact, survey methods are not. A survey of the statistical series may contain some error of measurement.

Establishment of control mechanism. This concept relates to a continuous adjustment process stabilizing the system, much like a thermostat stabilizing room temperature. Feedback control is important in monitoring the system, thus making the system self-adjusting so that it operates better. It guarantees modification of the system as external and internal conditions change over time.

Implementing the solution. Finally, the solution is put to work and the result is evaluated.

Techniques of Operations Research. In order to furnish some insight into the tools of the OR researcher, the following technique is mentioned, along with a selected reading list on operations research in the bibliography.

Mathematical Techniques. Any mathematical method can be of use to the OR practitioner. The methods in common usage are: differential equations, linear difference equations, and vector and matrix theory. Optimization methods include linear programming—the technique for determining optimum allocation of limited resources to maximize some predetermined objective. This is achieved by maximizing a system of linear equations subject to limitations placed on the magnitudes of one or all of

the variables involved. Among other techniques used are the game theory, the probability theory, and the Monte Carlo theory.

pert and cpm

The new breed of educational administrators is expected to understand and use quantitative techniques to structure and solve the problems that face him. Program Evaluation and Review Technique (PERT) is one of the techniques in administrative technology that can enhance the decision-making skills of the administrator.

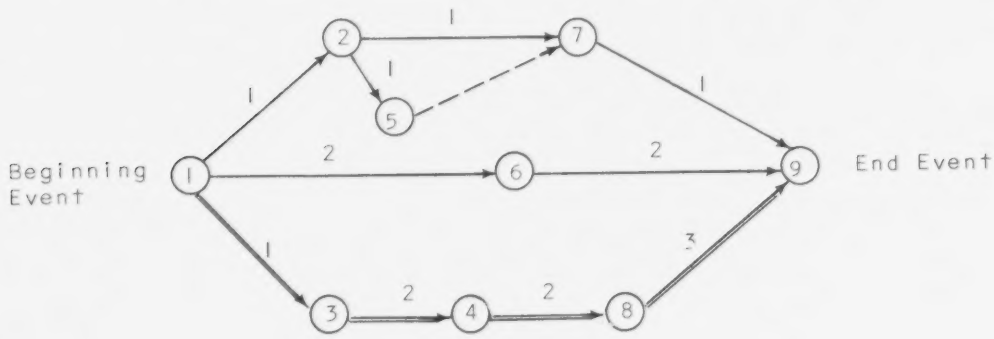
PERT is a type of network system used to plan, manage, control and monitor a project or program.

A network is a graphic representation describing a sequence of activities and their interrelationship with a project. In a network a small circle represents an event and an arrow depicts an activity. Events are beginning points or ending points of activities. They do not consume time or other resources.

An activity is a task explicitly defined to which resource requirements, including time, are attached and which is bounded by events. The longest path in time to reach an objective event from the beginning event is called the critical path. All other events and activities in the network that do not lie on the critical path, being shorter, are referred to as slack paths—areas in which a surplus of resources, including time, can exist.

A simple network system is represented below:

Figure 1



Where:

○ represents an event

⟶ represents an activity

----→ a dummy activity used to keep the sequence logically correct

⟹ critical path; the numbers above critical path designate units of time in weeks required to accomplish an activity.

This technique is of value in predicting, monitoring, and controlling resource inputs as well as in the recognition and measurement of uncertainty as it relates to management and the implementation of a project or program. PERT helps the planner of a project think through each step involved in the various phases of the project by showing the interrelationship of activities and the longest path in time from the starting event to the objective event (CPM). PERT can be used as a communication device which will help to communicate effectively to those who are not involved in the project or program, the scope and objectives that are to be achieved, as well as the magnitude of the time and cost, and trade off between them.

The critical Path Method and PERT differ in several ways; however, both concepts utilize a net work analysis technique to plan, schedule, and execute a program or a project:

a) CPM contains a cost time function which is a major component in maintaining project control.

b) PERT helps to expose probabilities of time estimates for accomplishment of a project. CPM lacks this feature.

c) The conceptual difference between CPM and PERT is that CPM is deterministic whereas PERT is probabilistic. PERT uses three time estimates in determining time required to complete a project. CPM uses one time estimate. CPM approximates activities that have been conducted before. PERT is more useful in areas where activities have not been attempted before.

The above discussion suggests that the network system can be conceived of in the following phases:

I - Planning Phase
II - Scheduling Phase
III - Control and Monitor Phase

The Planning Phase. During the process of planning all data inputs are assembled and the following steps taken:

1) An explicit and clear definition of the objectives to be accomplished.
2) A definition of activities that should be generated to accomplish objectives set in step (1).
3) A graphic construction of the work flow portraying the interrelationship of the activities set in step (2).
4) An estimation of time and cost of resource inputs necessary for accomplishing each activity.
5) A listing of all materials and equipment required for the completion of the program project.
6) Delineation of responsibility for each activity.

The Scheduling Phase. All information is determined and organized for each activity during the planning phase.

However, during the scheduling phase all critical activities are put together that comprise the critical path. Thus, the scheduling phase will produce both the critical path and noncritical activities. Consequently, the completion of the scheduling phase will show the beginning and ending providing opportunity for time adjustment if necessary; and the basis for analysis of resources once the magnitude, direction, and flow mechanism of each activity is known. Moreover, a time log for observing the progress of each activity is clearly developed.

The Control and Monitor Phase. During the control and monitor phase, with the addition of new activities and the adjustment of existing activities, the feedback mechanism that achieves the predetermined objectives of the project or program can be recognized.

PERT has been applied to educational research and the development of projects, curriculum development, experimental research, registration procedure, and the planning of comprehensive education programs and school facilities (Cook, 1966).

The preceding concepts provide an overview of management concepts that can be of value to vocational educators.

The following section provides a framework which will help the administrators of vocational educational programs restructure their existing programs into a Planning, Programming and Budgeting System mold. The section on Management Information Systems brings into focus the realization that the kind of information required to implement PPBS in vocational education may not exist. Thus, hand-in-hand with the attempt to install PPBS, efforts must be made to form an MIS that would make the required data available.

ppbs

Planning, Programming and Budgeting System (PPBS) is a synthesis of established techniques that are applied to the management and control processes to produce a program budget. The components of PPBS are not new. Educators have been dealing with selecting among alternatives for many decades. Most school boards have statements reflecting their goals and objectives. Teachers have been declaring their objectives in preparing course plans. Budgeting and accounting have had a distinguished history in the school systems. This new innovation is the integration of the above elements within a systematic whole. PPBS relates the output(s) of the activities of an agency to the input(s) that are consumed to produce the output(s).

PPBS is a technology for organizing information so as to facilitate the allocation of scarce resources in the decision-making process. In this context:

Planning is the process of determining the objectives and specifying alternative methods of achieving objectives;
Programming is the process of optimizing the mixture of resource (inputs) necessary to attain objectives. The term programming is used in a non-computer sense;
Budgeting is the process of systematically relating the expenditure of funds to the accomplishment of objectives or to a multi-year fiscal planning dimension of the process;
A system is a set of elements so interrelated and integrated that the whole displays unique attributes (See page 4).
The resource allocation process (McGivney and Nelson, 1969) is accomplished by:

1) An explicit identification of objectives in quantitative terms,
2) A systematic comparison of the benefits and costs of alternative objectives and alternative methods for the accomplishment of objectives, and
3) The projection of activities over the required time span.

A budget can be interpreted as a fixed rule for the allocation of resources, such as a typical government budget, or a planning and control device. Since latter interpretation pertains to PPBS, a comparison of the two may prove beneficial:

Comparison of PPBS and Line-Item Budgeting

PPBS	Line-Item Budget
1) Output-oriented	1) Input-oriented
2) Multi-year Fiscal implication	2) Single year fiscal implication
3) Offers alternative	3) Choice is made, no alternative
4) Policy decisions made before budget cycle starts	4) Decisions made as to shifts and cuts
5) Program changes dictate money shifts	5) Encourage across-the-board cuts and increases
6) Based on realistic and detailed assessment of program costs	6) Based on blanket concept which ignores differential costs
7) Outputs can be evaluated	7) Output evaluation not likely
8) Explicit, systematic, integrated	8) Vague, piecemeal, fragmented
9) Extensive data base and analysis is necessary	9) Analysis not required
10) Shows effects of policy decisions on individual programs	10) Hides effects of decisions
11) Stimulates innovations	11) Continuation of existing activities is encouraged

Some of the distinguishing characteristics of PPBS (Hatry & Cotton, 1967) are:

1) An across-the-board program structure, grouping together various projects and activities that contribute to the same objectives.

2) A multi-year program and financial plan, based upon the program structure, that explicitly covers the expected costs and benefits.

3) A program analysis that considers the alternative means available to achieve a particular objective, and recommends a solution in the light of pertinent financial, political and legislative constraints.

4) A program updating procedure that is responsive to changing needs and new information.

These are characteristic of PPBS as it should be rather than examples of how it functions.

At this point a brief examination of the history of PPBS may help to illumate some of these concepts. In the 1930's the Department of Agriculture instituted what was then called performance budgeting (Steiner, 1967). However, it was in 1949 that the Hoover Commission (Commission on Organization of the Executive Branch of Government, 1949) recommended:

> ...That the whole budgetary concept of the Federal Government should be refashioned by the adoption of a budget based upon functions, activities and projects; we designate this a performance budget.

In the 1950's the government did not pursue the systems approach seriously; however, the Rand Corporation, under the leadership of Charles Hitch, Roland McKean, and David Novick, pursued the essence of program budgeting and its application to national defense (Novick, 1968).

President John F. Kennedy provided great impetus to the establishment of PPBS by appointing Robert S. McNamara as Secretary of Defense. Within a few years PPBS became operational in the Department of Defense.

In 1965, President Johnson directed all departments and agencies to follow the example of the Department of Defense and initiate the establishment of PPBS. In September of 1967, the Bureau of the Budget was reorganized by programs such as:

> National security programs,
> Scientific, technological and economic programs,
> Human resource programs, and
> General government management programs.

These divisions were designed to transcend agency boundaries (*Business Week*, September 23, 1967).

It is apparent that the federal government made substantial progress in the establishment of a systematic approach to the allocation of resources at the federal level. Many states have followed this federal initiative and have taken steps to use the systems approach in the allocation of resources at the state level of government. The Wisconsin state government appointed a committee in 1960 to study the application of the pri-

vate business decision-making process to government. This committee recommended that:

1) The state should convert all agencies to program budgets.
2) The state should institute performance measurement and develop standards for accomplishments.
3) The state should institute multi-year fiscal planning.

A unique feature of the implementation of PPBS in Wisconsin state government has been the attempt to install PPBS at the intermediate level of government, the agency, rather than at the "top" decision-making levels and working downward. Agencies, for the most part, are set up on a program basis and the system can become more effective since it is the agency that initiates the process, while the stimulus, supervision, and coordination flow downward from above (Brown, 1968).

Before going on to examine the applicability of PPBS to State Government Agency functions, it is necessary to caution the reader not to be overly enthusiastic about the use of Systems Analysis. Like any other innovation, PPBS is not a panacea or cure all, rather it is designed to provide a criterion for decision-making so that a measure of rationality and optimality can be achieved in the planning process.

Aaron Wildavsky, an advocate of the traditional method of budgeting, feels the traditional system has served satisfactorily in the past and there is no reason why it should not continue to do so in the future (Wildavsky, 1961 & 1966).

Frederick Mosher (1969) has made the following observations on PPBS:

1) PPBS has been oversold. He feels this can be attributed to the success of PPBS in the Department of Defense. It was easily applied to certain program areas, such as weapon systems, but in other areas, such as maintenance and personnel, where its application was difficult, the lack of success was ignored.

2) Most of the literature of PPBS deals with an over simplified world. There is a need to put a price on everything. If the economists involved cannot obtain or estimate a realistic value for something, they tend to develop one artificially. Mosher contends there are values which cannot be priced, values which defy quantification.

3) Certain intrinsic difficulties of PPBS have not been dealt with. These include the determination of objectives in a democracy, quantitative measurement, problems with the administrative organization and legislative reaction.

4) States have problems that are unique to them, such as the great bulk of state spending which is mandatory.

5) Federalism itself presents great difficulties. There are two, three, or four levels of government concerned in virtually all domestic spending.

Charles Hitch (1967) is in agreement with some of Mosher's remarks.

> Although it did not appear so at the time, there is no doubt in my mind that the Department of Defense, or much of it, is easier to program and analyze quantitatively than many areas of civil government. For example, it is certainly easier than the foreign affairs areas.

While PPBS is not without limitations, it nevertheless displays several advantages over the traditional incremental budget system, as was illustrated in the previous section. (See comparison of PPBS and line item budget above.) PPBS places heavy emphasis upon agency organization. Without the proper agency organization, either deliberately designed along program lines or sufficiently flexible so as to "adjust" to program lines and thereby allow interagency as well as entra-agency coordination, the system cannot become airborne.

In business and industry, objectives are more explicit than they are in governmental entities. Almost all objectives of private business enterprise can be reduced to one: maximization of share value. In economic theory it is generally assumed that enterpreneurs attempt to maximize profit; when this is difficult, additional goals can be expressed in dollar magnitude.

Governmental entities are in the business of generating public services with multiple and varied objectives and different benefits, which, in many cases, do not accommodate quantitative measurements but are qualitative in nature. There are also problems in determination of costs. Moreover, the techniques used in the evaluation process present a set of limitations of their own, the implication being that the process of evaluation in the public sector of the economy is inferior to that in the private sector.

The meaning of multiplicity of objectives is expanded in an address to a committee chaired by Senator Proxmire of Wisconsin. Jack W. Carlson, Assistant Director of the Bureau of the Budget, (Sub Committee on Economy in Government, n.d.) outlined five objectives of government:

1) Provision of public goods.
2) Redistribution of income.
3) Elimination of spillover effects or externalities.
4) Maintenance of a smoothly running enterprise by preserving private competition, securing economics of scale, and making markets more efficient.
5) Management of resouces that are under the control of the federal government.

E. Staats, referring to a process such as PPBS, (Subcommittee on Economy in Government, n.d.) states the assumption that:

> . . .the goals and objectives were known, or could be reasonably defined for each program. This assumption did not appear to recognize that no consensus has been reached regarding national goals and objectives.
>
> . . .If our goals were solely economic efficiency, then a process such as PPBS would guide us toward that one ultimate objective. But we do not seek one objective. Instead we have numerous goals such as security, enterprise system, and many others. These goals cannot in all cases be accomplished to be consistent with the highest degree of economic efficiency.

Realizing the existence of multiple goals, can we attempt to evaluate them? Some propose that projects should be evaluated in terms of economic efficiency with the provision that results be adjusted to account for other effects. Arthur Maass suggests that a project should be evaluated in terms of what it is designed to accomplish and not in terms of economic efficiency alone (Maass, 1970).

In the process of evaluation an initial step is identification of benefits. Senate Document No. 97 (Subcommittee on Economy in Government, n.d.) provides the following definition:

> Increases or gains, net of associated or induced costs, in the value of goods and services which result from conditions with the project, as compared with conditions without the project.

Benefits can be classified in three categories: principal or subsidiary, primary or secondary, and internal or external.

Principal benefits are those for which the project is intended, while subsidiary benefits are those additional benefits which accrue as a result.

Primary (direct) benefits are those which accrue to the real sector of the economy, while secondary (indirect) benefits result from inefficiency of the market system. For example, a public investment project, such as a dam, may reduce the cost of electricity in an area, or in the case of underdeveloped countries, make it available for the first time. The benefits accruing to the population from the reduction in price, or the availability of electricity, are primary.

However, due to the existence of the dam and availability of low cost electricity, a private business enterprise constructs a manufacturing plant in the community, thus providing employment opportunities in the area, increasing the income of the people in that locality. This is an example of secondary benefits.

The definition of internal and external benefits is similar to that of primary and secondary benefits described above, and can be regarded as a subclass to them.

Externalities may be defined as those effects for which there is no specific market. Thus we can state that a steel plant produces two products: steel and polluted water. While there is a viable market for the steel, no specific market exists for the polluted water. The steel manufacturer does not consider the negative effect of pollution in determining his profit; however, the government, in computing Gross National Product, must include both positive and negative aspects of steel production. What is being dealt with are diseconomies. Externalities can accrue in a productive form. The classic example is a man who raises bees for the production of honey, in a location next to an apple orchard. The bees pollinate the apple trees, and the apple blossoms aid in the production of honey.

Assuming the benefits can be identified, how are these benefits to be evaluated? A number of questions arise. Can benefits be quantified? If so, do we express them in dollar magnitudes? Another aspect of the evaluation process is the determination of costs. Marglin (1968) has indicated that costs and benefits are two sides of the same coin. With this point in mind, one can refer to costs merely as the monetary outlay required by a project. Thus we can proceed with the problem of project evaluation.

Few people have expressed a clear distinction between cost-benefit and cost-effectiveness in the literature. J. W. Carlson relates numerical output of alternatives to their costs. Cost-benefit reduces both the costs and benefits to dollar magnitudes (Subcommittee on Economy in Government, n.d.).

A numerical example may be helpful in clarifying the distinction between cost-effectiveness and cost-benefit ratios:

Cost-Effectiveness Ratio

Cost-effectiveness is defined as the ratio of the quantity of output derived from a project to its costs:

$$CE = \frac{\sum_{t=1}^{n} \frac{Q_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+r)^t}}$$

Where Q_t = annual quantity of output

t = number of years

r = interest rate = 10%

C_t = annual costs of output

Greek letter Σ (sigma, for sum) is used to denote sum of terms.

Example:

Year	Output	Costs
1	0	$8,000
2	60	$6,000
3	120	$6,000

$$C - E = \frac{\frac{0}{(1+.10)^1} + \frac{60}{(1+.10)^2} + \frac{120}{(1+.10)^3}}{\frac{8,000}{(1+.10)^1} + \frac{6,000}{(1+.10)^2} + \frac{6,000}{(1+.10)^3}} = \frac{139.80}{16742.70}$$

C - E= 0.008

Advantages: Considers all costs, output, and time valid for comparing Alternative activities which produce an identical type and quality of output.

Disadvantages: Invalid if outputs are of differing type or quality. Does not consider value of output.

Cost-Benefit Ratio

Cost-benefit ratio is a ratio of the monetary benefits derived from a project with respect to its costs.

$$B - C = \frac{\sum_{t=1}^{n} \frac{R_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+r)^t}} \qquad R_t = P_t \cdot Q_t$$

the price or monetary value times the quantity of output in year t

Example:

Year	Units of Output	Price per Unit	Total Costs
1		$150	$8,000
2	60	$150	$6,000
3	120	$150	$6,000

$$B - C = \frac{\frac{(50)\ \ (0)}{(1 + .10)^1} + \frac{150 \times 60}{(1 + .10)^2} + \frac{150 \times 120}{(1 + .10)^3}}{\frac{8{,}000}{(1 + .10)^1} + \frac{6{,}000}{(1 + .10)^2} + \frac{6{,}000}{(1 + .10)^3}} = \frac{\frac{9{,}000}{1.20} + \frac{18{,}000}{1.30}}{16742.70}$$

B - C= 1.252

Advantages: Considers all monetary benefits, costs, and time.
Disadvantages: Ignores nonmonetary benefits or requires their estimation in monetary terms (McGivney and Nelson, 1969).

An essential characteristic of cost-benefit as an instrument of analysis, is the pricing of benefits so that their value can be determined. The market price is a good indicator of the value of benefits if it exists. In determining redistribution benefits, the appropriate measure is the difference between what the individuals are willing to pay and what they end up paying (Marglin, 1968). It has, however, been noted by Bierman and Schmidt, that the market price is not always the proper yardstick. In a market where monopoly prices exist prices do not necessarily equal opportunity costs.* In cases where the opportunity cost is less it should dominate the price in benefit calculation. In other cases the project itself may be sufficiently large to change the price so that neither the price nor the opportunity cost may be the relevant value. Let us consider the dam project again and assume that, after going into operation, it would lower the price of electricity in the area substantially.

Assuming that the market price equals the value of the resources expended in production (opportunity costs) in both cases, if the dam lowers the price from P_1 where quantity q_1 is sold, to P_2 where q_2 is sold, it is possible that the change in the total value of electricity produced could be negative; that is to say, $(P_1 \cdot q_1)$ may be greater than $(P_2 \cdot q_2)$. In such a case, the proper value to use for evaluating the benefit of the dam would be somewhere between P_1 and P_2 (Bieman & Schmidt, 1966).

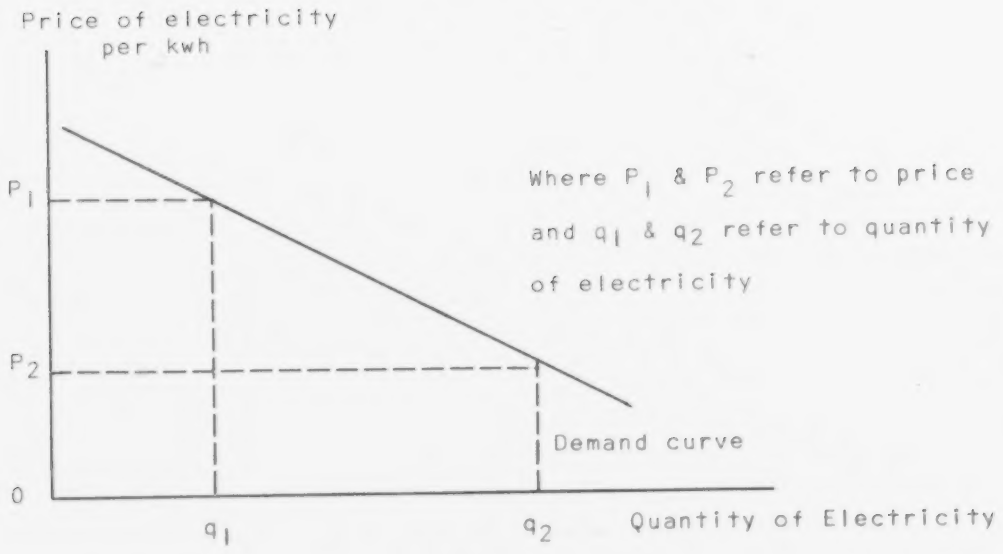
It is possible that the economist performing the evaluation may not be able to arrive at any value for the benefits under consideration. In such a case, he should try to make estimates of the benefit in terms of some relevant quantity other than dollars.

Wiesbrod (1968) states,

One should not confuse the quantifiable estimates of benefits

*The opportunity cost of anything is the value of its best alternative. Example: When George Bernard Shaw reached his 90th birthday he was asked how he liked being ninety. He replied, "It is fine when you consider the alternative."

The opportunity costs of being in school are the foregone earnings of students who continue their education rather than entering the labor market.



with their value in dollar terms. These two tasks are analytically separable. Though consensus may not be available on the latter, it more likely exists on the former.

Failing to recognize this fact may cause considerable disenchantment with PPBS. Samuel B. Chase (1968) observes:

The scope of the PPBS approach is severely limited because economic analysis has yet to discover satisfactory ways of evaluating the benefits of public programs. Here PPBS must limit itself to quantifying only the costs and the benefits from alternative policy choices, rather than pointing to an optimal policy decision, because economics has yet to discover satisfactory ways to value many of the benefits of financial decisions.

How can we, then, utilize cost-effective analysis? It can be used in making a political decision but not in an optimal decision-making process, as can be done with a cost-benefit analysis.

Cost-effectiveness is of value in determining the most appropriate project, i.e., between such similar projects as Polaris and Air Force bombers. If we are comparing the marginal value of $500 million for either education or defense, we can only say the relevant values are 34,000 man years of training versus the defensive value of each. This is a function of the political decision-making process. In some projects the benefits may best be expressed in qualitative terms; in such cases cost-effectiveness loses much of its value.

PPBS is by no means a substitute for human judgment, experience and wisdom. Moreover, it does not attempt to computerize the decision-making process and/or to serve as a cure-all problem solving process.

If PPBS is to succeed, it is imperative that the head of the agency support it fully. It requires a specialized staff to analyze objectives on a continuous basis and to implement necessary programs to meet the predetermined objectives. Under most circumstances people with a good

background in economics are expected to have an advantage, although many people without formal training in economics have performed quite well.

Application of PPBS

We have stated that in the government sector all expenditures (or costs) can be quantified, but benefits do not always accommodate quantification. Even if we could quantify benefits, they cannot easily be reduced to a common denominator, that is, dollar magnitudes.

In business virtually all variables can be expressed in terms of their dollar counterpart.

Paul Brown (1968) of the Wisconsin Bureau of Budget and Management felt that a successful implementation of PPBS could be effectively initiated at the intermediate level of government, the agency. The agency of interest to us is the state vocational education agency—Wisconsin Board of Vocational, Technical and Adult Education.

Before we discuss program structure of PPBS for the state vocational education agency, some concepts warrant definitions:

Mission: A mission statement describes the reason for existence of the agency which is usually prescribed by law.

In Wisconsin, the Board of Vocational, Technical and Adult Education Mission Statement declares that:

> The system is dedicated to meeting the needs of the large proportion of the general public beyond the age of sixteen regardless of color, race, creed or national origin who can benefit from Vocational, Technical and Adult Education services, and it recognizes the many persons who currently aspire to seek and achieve post-secondary education other than that considered to be part of baccalaureate or higher degree curricula. It is committed to the development and conservation of our human resources for purposes of occupational preparation and updating.

Goals: Goals are general statements of purpose or intent toward the accomplishment of which the agency's efforts are directed. Goals are not quantifiable or measureable and are not related to a specific time period. Goals are broad in scope.

> *Goals of Vocational Education in Wisconsin:*
>
> Provision is made for training at secondary and post-secondary levels, for training of both youth and adults for equipping the handicapped and disadvantaged to assume an active role in the world of work and for the development of special program-research activities, exemplary undertakings, residential schools, consumer and homemaking education, cooperative training pro-

jects, and work-study arrangements—aimed at increasing the effectiveness and availability of vocational education while assisting all persons desiring to do so to benefit, both as citizens and as producer-consumers, from the opportunities and challenges available to them.

Objectives: Objectives are quantifiable accomplishments within a time period. They relate to one or more goals, they can be measured; the time period of achievement is explicit; and the method of measurement is known.

Example: Training X number of students in a one-year vocational diploma program for employment as mechanical draftsmen.

Program: A program is a group of interrelated activities directed toward accomplishment of an objective; a grouping of program elements which have similar outputs (what services for whom).

Program Element: A program element is the basic unit of program structure with explicit output(s).

Activities: Activities are methods by virtue of which objectives are attained.

Tasks: A task is one or more aspects of an activity, such as a lecture in chemistry or a machine shop class.

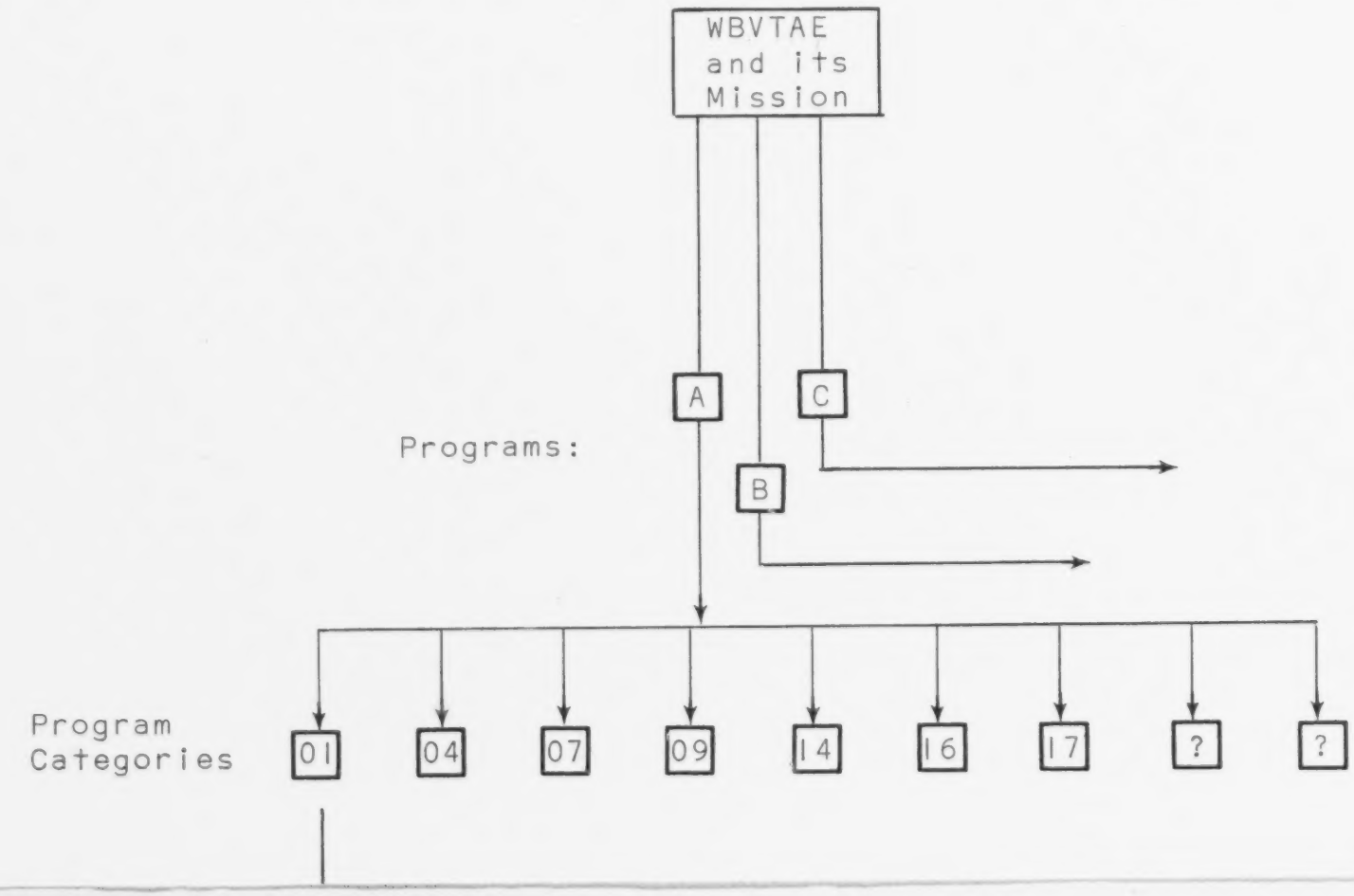
The proposed program structure for the Wisconsin Board of Vocational, Technical and Adult Education is designed to depict how any subprogram can be broken down into two digits or more of the OE coding structure. However, for the sake of simplicity and ease of exposition only seven major categories out of the existing 22 are dealt with. (See *Standard Terminology for Curriculum and Instruction in Local and State School Systems*, Volume II, Fourth Draft, Published by the U.S. Department of Health, Education and Welfare.)

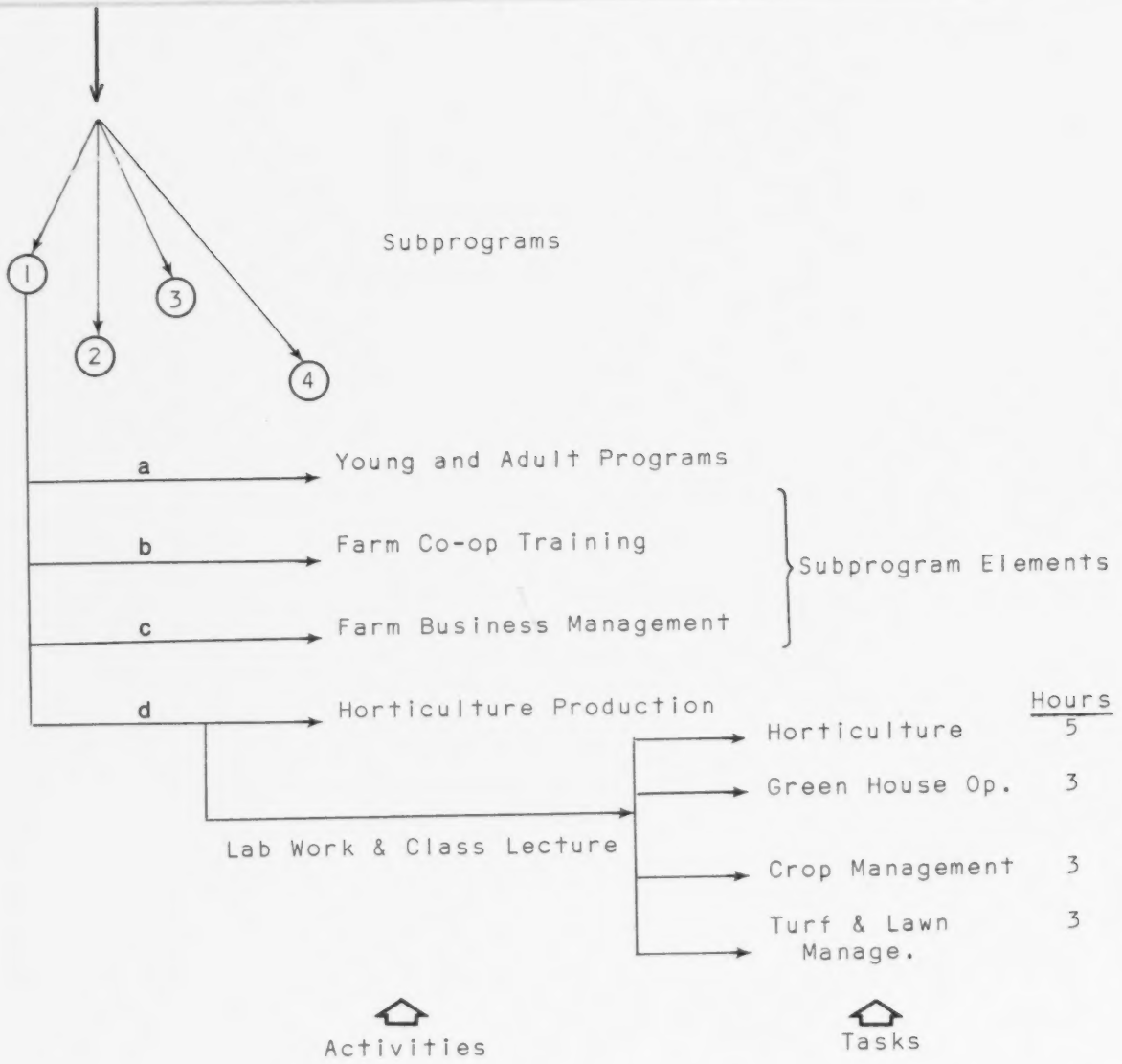
Program categories considered are:
01.0000 Agriculture
04.0000 Distributive Education
07.0000 Health Occupations Education
09.0000 Home Economics
14.0000 Office Occupations
16.0000 Technical Education
17.0000 Trade and Industrial Education

Each of the above classifications can be broken down into their respective subprograms. In the case of Agriculture (OE 01.0000), the schools of Vocational, Technical and Adult Education at present either offer or are planning to offer four subprograms:

Figure 2

A Hypothetical Program Structure for Wisconsin Board of Vocational, Technical and Adult Education




Subprograms
1
2
3
4
a
Young and Adult Programs
b
Farm Co-op Training
c
Farm Business Management
Subprogram Elements
d
Horticulture Production
Lab Work & Class Lecture
Hours
Horticulture 5
Green House Op. 3
Crop Management 3
Turf & Lawn Manage. 3
Activities
Tasks

1) Agricultural Production,
2) Conservation,
3) Process and Marketing,
4) Supplies and Services.

These subprograms can be divided into their respective subprogram elements, such as:

a) Young and Adult Program
b) Farm Co-op Training
c) Farm Business Management
d) Horticultural Production

The above categories can be separated into activities, that is course offerings that make up the program in horticultural production. Thus, Crop Management, which carries five credits, and Turf and Lawn Management, which carries three credits, are tasks that constitute an activity which, in turn, would produce a student with the prescribed skill in subprogram element one (see Figure 2).

We then measure all inputs and all outputs of an activity or a task and sum these activities or tasks to get inputs and outputs of activities, subprogram elements, subprograms, program categories, all the way to programs. Thus, we have a process whereby comparison of one program with another is possible.

If we establish data elements that identify inputs and outputs, then the establishment of measurement criteria and performance indicators will allow us to furnish objective grounds for the evaluation of the output of vocational education and relate benefits to their costs wherever quantitative or qualitative magnitudes can be estimated.

performance indicators *

Performance indicators are measures of achievement by the agency in providing educational services. Performance indicators are the instruments of program analysis and the evaluation of program performance. Performance indicators provide the information necessary to make a comparison of the output of a program with its total cost (cost-effectiveness). The indicators defined below are useful in relating outputs to costs:

1) *Measures of Extensiveness*: This indicator relates program performance to its output. Example: number of students in each subprogram, or the number of students enrolled in full-time vocational education programs from the pool of total high school graduates in Wisconsin. This is essentially the question of "how many?" or "how much?", but not "how well?".

*Adopted from the *Manual on Program Budget Preparation* published by the Department of Administration, Wisconsin State Government, 1970.

2) *Measures of Efficiency*: This indicator measures the value for a given cost, that is, the efficient utilization of public resources. It is a ratio of output to input. Example: the number of students that complete (are graduated from) a degree program out of the total number of students that enrolled in that program (a one or two-year vocational diploma program as prescribed). This measure also would show the attrition rate.

3) *Measures of Effectiveness* (how well): This indicator relates the results to program objectives. If the objective of a program were to train and place X number of auto mechanics in a one-year vocational diploma program, then how many would be placed on a job for which they received instruction? Thus, out of X-number of students completing the program, how many entered the job market related to their skill? This also is a ratio. This indicator can designate job retainment as well.

4) *Measures of Program Benefits*: A method for the measurement of monetary benefit is earnings. An example would be two high school graduates, one entering a post-secondary vocational diploma program and the other entering the labor market. A study completed for the Wisconsin Board of Vocational, Technical and Adult Education in the Summer of 1970 by the author and Dr. Gordon Philpot, based on follow-up information compiled by District 9, showed that in a work span of 30 years, students with vocational diploma training can expect to earn upward of $60,000 more than the student who entered the job market after high school graduation. Earnings are private benefits which accrue to the individual. This person pays more taxes, and thus contributes to the welfare of others as well. Moreover, there are other benefits, such as a better informed citizen.

management information systems

Thus far it has been implied that the agency concerned with the adoption and implementation of systems concepts has the capability of determining and generating all the information needs of such an organization. However, if the pertinent information is not available, attention must be called to the kind and variety of information needed to fill the information gap. This constitutes the subject matter that we have treated in the form of a project proposal, which will, in a broad sense, help to establish a functional Management Information System (MIS). Since everyone concerned may have his own design for information needs, it makes sense to start with the same basic information so that a system can be designed to meet individual needs and thus avoid duplication of effort and resources.

Production of reliable and timely information for decision-makers, researchers, and planners is both time consuming and costly. However,

such an investment does justify its cost and can be approached in the following ways:

1) By hiring the service of a consultant and farming out the job of meeting information needs of the agency. Thus the "firm" will produce reports for the agency as they are requested (monthly, semiannually, etc.). However, such an approach may prove both costly and inconvenient.

2) By hiring MIS specialist(s) in staff capacity and having him plan, design, develop and implement a functional MIS for the agency. This approach is desirable if the staff would be allowed to work on this assignment on a full-time basis.

3) By giving top priority to the establishment of MIS, creating a task force within the agency, preparing a detailed list of information needs of the agency, and bringing a consultant to help plan, design, develop and implement MIS in phases over a one-three year period. However, it would be most helpful to have one or more resource persons to work with the consultant on a full-time basis, so that once the consultant leaves, the agency personnel continue to keep MIS in operation.

The writer prefers the following structure:

I. *Objective: Development of a Systems Model*

The model should provide for collection, storage, processing, analysis, summarization and reporting of information to users and management of a vocational education agency at the state level.

II. *Overview of the Problem*

One of the most important resources that any institution (private or public) must effectively utilize to achieve its predetermined objectives is information.

Since dynamic institutions experience rapid change over time, the information base necessary for the accomplishment of the institution's objectives must change to attain the successful fulfillment of the mission of the institution.

Vocational education has experienced phenomenal growth in the delivery of its educational services to the public. This growth pattern is expected to persist in the future. However, existing practices in the collection, storage, processing, analysis, summarization, retrieval, and timing of the information production process may no longer meet the information requirement of the management and the staff of the agency. This is why planning, designs, and implementation of a Management Information System must be assigned top priority by the management of the agency.

It is, necessary, therefore, that the state agency invest the required resources in research to establish an information system that will meet the requirements of the agency's activities for planning, budgeting, operation and evaluation of the attainment of the program objectives of the agency, as well as an evaluation of past decisions.

This project is concerned with the development of an appropriate system that will provide the information demands of the agency.

III. *Phase One: The Body of the Proposal—Systems Planning and Its Major Objectives*

A. *Objectives*

1. During the planning phase the state agency should specifically define the major objectives of systems, prepare an overall system design, outline reporting requirements, and determine the schedule and approximate cost and implementation of the system design.

2. After top management review and approval of the systems plan, the systems development phase can begin.

B. *The System*

A system will be developed to function on a continuing basis to meet the information requirements of the agency. More specifically, the system will provide information at several levels:

1. Information required by the top management of the agency, which includes the State Director, Assistant State Director, Division Administrators, State Supervisor, and other users in whatever quantity, quality, variety and frequency they deem necessary for the decision-making process for accomplishing their respective objectives.

2. Customized information necessary for production of various reports as required from the agency by:

a) executive branch of the state government
b) legislative branch of the state government
c) individual departments of the state government
d) the state board and advisory council
e) coordinating council for higher education (Wisconsin)
f) the federal government
g) other demands for information as they develop in the future, and pertain to the particular needs of the agency

C. *Structure of a System and Its Objectives*

The system may consist of a set of subsystems and elements that are integrated and interrelated:

1. student related data elements
2. staff related data elements
3. course related data elements
4. facilities related data elements
5. financial related data elements
6. socioeconomic related data elements

To accomplish the above objectives, a detailed and uniform definition of data elements that are responsive to objectives of the agency must be constructed. A complete inventory must be made of all data elements presently collected and generated and adapted to the fullest extent possible for use in the new subsystems. This would save much time and avoid duplication of efforts. A procedure must be established through which elements will be classified into their respective subsystems.

During the planning phase a number of activities will be generated. The main thrusts of these activities are:

1. *Interview*
   a. The responsibility of the respondent
   b. The objectives of the respondent in relation to the services generated by MIS and what he expects to accomplish
   c. The specific problems which the respondent can identify as requiring solutions.
   d. The MIS plan and what it should generate as the respondent sees it.
   e. Current uses for Electronic Data Processing services as the respondent sees it.
   f. Information requirements that the existing system does not provide as the respondent can identify them.
   g. Any other comments, specific or general, which may be of use to the initial study of the systems plan.

The result of the interviews will be assembled and presented to all respondents with final details centered around the objectives of management and the users.

2. *Management Summary*

   A summary report will be prepared for the management which will contain conclusions and recommendations resulting from the planning phase.

IV. *Phase Two: The Development of the System and Its Basic Attributes*

A. *Primary Function*

The primary function of this phase is detailed design and development of the systems. All input and output requirements will be designed. The data flow and control mechanism will be designed. Top management will be informed and after their review and approval, the detailed computer programming and manual procedure writing will take place. At this point the entire system will be tested.

B. *Attributes of the System*

The system should attempt to incorporate the following:

1. A functional system must be simple to install and operate, with language that decision-makers, management, and users can understand.

2. A good system is flexible. Agency objectives and priorities change over time but the system should be flexible enough to accommodate

and adapt itself to organizational changes. The system must be responsive to changing needs and changing information.

3. It is important that the new system does not lose the resources of the institution's existing systems. Maximum use of data already generated can be adapted for use by new systems. This saves much time and avoids duplication of efforts, and also saves wasting the effort of those who have worked hard to develop a subsystem.

4. A bypass routine provided in case of destruction of the computer, files or other unforeseen events so that the system is able to generate information requirements of the agency (the security of the system).

5. The system should not produce reports which would consume excessive time and effort of the agency's executives. Summary reports should be so prepared that management and user needs be fully served.

6. The system should operate to achieve only those functions necessary to serve the agency objectives. Data should be used often enough to justify the cost of producing it.

7. Data processing and computer usage must be coordinated and inputs utilized to minimize piecemeal operations.

8. Data should be captured at the earliest opportunity in the processing cycle for the sake of accuracy and economy.

9. The system should not be constructed around the particular capabilities of individuals. It should not be personalized since a person might move, but the system must remain with the agency.

10. Collection of verified facts is essential to a good systems design.

implementation of ppbs

The Research Corporation of the American Association of School Business Officials (ASBO) has completed (April, 1971) a working draft under the title of "Educational Resources Management System."

The ASBO project is an attempt to develop the conceptual design for an integrated system of planning, programming, budgeting and evaluation (Dade County Public Schools, 1969).

The question posed is: How can public educational institutions (districts) be managed more effectively? ASBO's answer is:

> The Educational Resource Management System (ERMS) should be viewed as a basic conceptualization of a planning, programming, budgeting, and evaluating system (PPBES) application. The system is designed for the management of educational resources in local school districts. The major processes of the ERM System as presented here are not new to education. The novelty is in 1) the suggested relationships of these major processes, 2)

> the implications for the evaluation of much greater sophistication in the operation of each of the processes, and 3) the possibilities for improving the effective operation of local public education through better decision-making about the use of educational resources.

ASBO pilot districts included the following: Clark County, Nevada; Douglas County, Colorado; Milwaukee, Wisconsin; Memphis, Tennessee; Peoria, Illinois; Westport, Connecticut; Montgomery County, Maryland; and Herricks, New Hyde Park, New York.

Public school districts in Skokie, Illinois; Darien, Connecticut; the Philadelphia school districts; and Pearl River, New York have embarked upon some sort of a PPBS operation. However, the full extent of the implementation process is not known at this time. In California (California State Department of Education, 1970), school districts produced a PPBS Manual with the following purpose and scope:

> The manual is presented as a guide for the implementation of a PPBS in California school districts. It contains reference material which may be consulted to gain an understanding of the elements and processes of PPBS as well as definitions of terms, minimum initial implementation requirements, and recommended forms and procedures. It does not recommend specific organizational or procedural patterns as these will be determined by individual school districts.
>
> Part II—Description of an Operational PPB System, describes the intent, scope, elements and processes of an operational PPBS and discusses the impact of PPBS upon normal school district activities. It is presented for the interested and involved citizen, board member, administrator, teacher, parent, or student who seeks a general understanding of the purpose and nature of PPBS.
>
> Part III—Implementation of a PPB System, presents recommendations for tasks to be accomplished during the initial phase of PPBS implementation. Alternative methods of proceeding during the implementation phase and the requirements for planning future year activities are also discussed. Part III contains sections of interest to persons fulfilling specific roles in the implementation process as well as to those charged with overall direction of the implementation effort.
>
> A PPBS Training Manual designed to assist in-service training efforts in district and county offices will be available in the Fall of 1971.

The California State Department of Education (1970) anticipates the implementation of the system in all California school districts by the 1973-74 school year.

concluding remarks

The management of educational institutions requires a team of specialists. Analysis of the economic aspects of occupational education, the changing posture of the demand for skilled labor, the resources necessary to generate a supply of marketable skills, and cost-benefit analysis requires the talents of economists. Quantitative analysis of available data in education demands the services of statisticians and/or mathematicians. Collective bargaining in public education and analysis of legislation affecting the delivery of educational services to the public calls for trained specialists. Electronic data processing, facilities planning, financial planning, and teacher certification require specific skills as well. As a result, the interdisciplinary approach has gained much prominence in the area of education, and since most people are not expert in more than one discipline, the need for the "team" approach is here to stay.

As Knezevich (1969) has observed:

> The state education agency acting through the state board, the chief state school officer, and the state education department, has a most important role in public education. It is imperative that individual state governments, as well as the federal government, exert every effort to enhance the leadership capabilities and strength of state education agencies. Unfortunately, in most states the potential of the state department of education has gone largely unrealized, due in large measure to the inadequacy of resources allocated to the department. Even though no echelon has ever been granted all the funds that are desired, the state agency has been the most inadequately supported of the three echelons of education. The lack of sufficient resources has made it impossible, in many cases, to employ a staff large enough and of sufficient quality to fulfill the leadership mandates of state education departments.
>
> Fortunately, there are exceptions to this generalization, and they demonstrate what can be done if adequate resources are forthcoming. For example, in New York a special study was made of the role of the state education agency in promoting change, and in Florida and California electronic data processing for school systems has been developed.
>
> It will be extremely difficult if not impossible to develop an excellent public school system without greatly improved state departments of education. Better organizational structure, with appointment rather than election of education is needed to translate sufficient resources and flexible personnel policies into imaginative programs. State education agencies have traditionally played a significant role in influencing legislative action on educational policies. This role needs to be strengthened to enhance the lead-

ership image of state education agencies. In addition, state planning and evaluation systems must also be strengthened.

In Wisconsin 65 cents of every tax dollar resource is being spent on education. All educational institutions are being asked to show how efficiently these scarce tax resources are being allocated. Every educator is searching for a system that would help measure the output of educational institutions and relate it to their costs. Systems concepts, with all the shortcomings, can be effectively used to serve this purpose. We must use the instruments that are available to us and, through research, attempt to increase their effectiveness by applying them forcefully and by taking measures to improve them over time.

The executive officers of educational agencies should consider the following precautions if they want to utilize the systems analysis approach:

1) Understand management concepts, their uses, resource requirements, and limitations.

2) Avoid too quick implementation.

3) Remember slow step-by-step and inphase implementation would require three-five years.

4) Give responsibility to one resource person with basic background in management concepts. Also, give that person the authority and the resource base to carry out the process of planning, developing, designing, and implementing of PPBS.

5) Devise programs that would train and prepare agency staff so that they understand management concepts and their value to the agency. It may be necessary to bring consultants to perform this task, keeping in mind the particular mission of the agency.

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MISSION OF THE CENTER

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- Programmatic focus on state leadership development, vocational teacher education, curriculum, vocational choice and adjustment.
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